

## AIR TEMPERATURE CONTROL

### 1. GENERAL

#### A. RELATED DOCUMENTS

- 1) ALL WORK SHALL BE SUBJECT TO THE GENERAL CONDITIONS AND SHALL COMPLY WITH APPLICABLE REQUIREMENTS OF THE CONTRACT.

#### B. REFERENCE STANDARDS

- 1) MATERIAL AND INSTALLATION SHALL COMPLY WITH LATEST EDITIONS OF APPLICABLE CODES, RECOMMENDED PRACTICES AND STANDARDS OF AISC, AIA, MEI, EEE, EIA, ASDI AND U.I.

#### C. SUBMITTALS

##### 1) GENERAL

- a) EQUIPMENT AND MATERIAL SUBMITTALS SHALL SHOW SUFFICIENT DATA TO INDICATE COMPLETE COMPLIANCE WITH CONTRACT DOCUMENTS AS FOLLOWS:

- (1) PROPER SIZES AND COMPLETE PERFORMANCE DATA.
- (2) THAT THE ITEM WILL FIT IN THE AVAILABLE SPACE, IN A MANNER THAT WILL ALLOW PROPER SERVICE.
- (3) CONSTRUCTION METHODS, MATERIALS AND FINISHES.
- (4) INSTALLATION INSTRUCTIONS.
- (5) CONTROL AND WIRING DIAGRAMS.
- (6) OPERATING INSTRUCTIONS.

- b) CATALOG DATA MUST SHOW CLEARLY MARKED THE ITEM OR NUMBER TO BE FURNISHED, WITH ALL ACCESSORIES INDICATED. ALL IRRELEVANT INFORMATION MUST BE MARKED OUT, LEAVING ONLY THAT INFORMATION WHICH IS PERTINENT TO THE EQUIPMENT OR SYSTEM.

- c) SHOW ALL DIMENSIONS OF EACH ITEM OF EQUIPMENT ON A SINGLE COMPOSITE SHOP DRAWING, NOT ON A SERIES OF DRAWINGS. PROVIDE SEQUENCE OF OPERATION FOR EACH SYSTEM, ACCOMPANIED BY THE WIRING DIAGRAM.

- d) COORDINATE EACH SUBMITTAL WITH REQUIREMENTS OF THE WORK AND OF CONTRACT DOCUMENTS FOR DIVISIONS 15 AND 16 PRIOR TO REVIEW AND APPROVAL.

- e) NOTIFY THE OWNER IN WRITING AT TIME OF SUBMISSION OF DEVIATIONS IN SUBMITTALS FROM REQUIREMENTS OF CONTRACT DOCUMENTS.

- f) BEGIN NO INSTALLATION WORK WHICH REQUIRES SUBMITTALS UNTIL RETURN OF SUBMITTALS WITH PROPERLY EXECUTED STAMP INDICATING REVIEW AND APPROVAL.

- 2) PROVIDE THE FOLLOWING SHOP DRAWINGS:

##### a) MANUFACTURER'S DRAWINGS

- (1) CATALOGUE CUTS AND MANUFACTURER'S DRAWING OF ALL AUTOMATIC TEMPERATURE, PRESSURE AND HUMIDITY SENSING AND CONTROL DEVICES INCLUDING RANGES, SET POINTS, ADJUSTABILITY AND ACCESSORIES. IDENTIFY EACH SHEET TO CORRELATE EQUIPMENT DESIGNATION WITH INSTALLATION DRAWINGS.

##### b) CONTROL DIAGRAMS

- (1) SUBMIT CONTROL DIAGRAMS FOR ALL CONTROL SCHEMES, WITH WRITTEN DESCRIPTION OF ALL CONTROL MODES AND FUNCTIONS FOR EACH SYSTEM.

- (2) THE CONTROL SEQUENCE IN THE SPECIFICATIONS DESCRIBES THE PERFORMANCE OF THE VARIOUS SYSTEMS. PROVIDE ALL CONTROL ELEMENTS, FUNCTIONS AND WIRING FOR THE INTENDED SYSTEM OPERATION, AND SHOW SAME ON DIAGRAM.

##### c) INSTALLATION DRAWINGS

- (1) FRONTAL EXTERIOR VIEW OF EACH LOCAL CONTROL PANEL SHOWING LOCATION OF SWITCHES, GAUGES AND PILOT LIGHTS, ASSOCIATED LABELS AND FLOW DIAGRAMS.

- (2) INTERIOR VIEW OF LOCAL CONTROL PANELS SHOWING PHYSICAL LAYOUT OF ALL DEVICES, INTERCONNECTING WIRING AND IDENTIFICATION TAGS.

##### d) GENERAL SCOPE OF WORK

- (1) PROVIDE A COMPLETE INSTALLATION OF PNEUMATIC/ELECTRONIC/ODG CONTROL SYSTEM FOR CONTROLLING, SUPERVISING AND AUTOMATICALLY MAINTAINING THE DESIRED SPACE CONDITIONS AS SET BY THE VARIOUS THERMOSTATS, PRESSURE SENSORS AND OTHER SENSORS AND CONTROLLERS SPECIFIED OR INDICATED.

- (2) THE ENTIRE CONTROL AND BUILDING MANAGEMENT SYSTEM (BMS) SHALL BE PROVIDED BY HONEYWELL, SIEMENS OR OTHER MANUFACTURER'S SYSTEMS. THE SYSTEM SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING FUNCTIONS:

- (a) FUTURE FUNCTION/POINT EXPANDABILITY.
- (b) INTERLOCKING WITH THE FUEL MANAGEMENT SYSTEM.
- (c) SCHEDULED START-UP AT RESTORATION OF POWER AFTER AN ELECTRICAL OUTAGE.
- (d) PROGRAMMED START/STOP.
- (e) EXECUTION OF LIFE SAFETY INSTRUCTIONS RECEIVED FROM FIRE COMMAND CENTER, FCC.
- (f) DIAGNOSTIC SYSTEM DISPLAY FOR EACH HVAC SYSTEM.

- (3) CONTROL SYSTEM SHALL BE AUTOMATIC IN OPERATION AND SHALL UTILIZE COMPRESSED AIR FOR PNEUMATIC SIGNALS AND FOR PNEUMATICALLY OPERATED ACTUATORS SUCH AS CONTROL VALVE AND DAMPER PNEUMATIC MOTORS.

- (4) ALL PROPORTIONING TYPE DAMPERS SHALL HAVE PNEUMATIC ACTUATORS; UNIT HEADERS SHALL BE ELECTRIC MOTOR ACTUATED VIA ELECTRIC LINE VOLTAGE THERMOSTATS.

- (5) IT SHALL BE THE DIVISION 15 CONTRACTOR'S RESPONSIBILITY TO EMPLOY TEMPERATURE CONTROL AND FUEL MANAGEMENT SYSTEM MANUFACTURERS UTILIZING COMPATIBLE SIGNALS AND COMPATIBLE EQUIPMENT WITH EACH OTHER'S SYSTEMS AND THE BASE BUILDING SCADA SYSTEM.

### 2. PRODUCTS

#### A. PNEUMATIC ROOM THERMOSTATS (BYPASS DAMPERS)

- 1) IN MEPS AND OTHER UTILITY SPACES, PNEUMATIC ROOM OR RETURN AIR THERMOSTATS SHALL BE FULLY PROPORTIONING WITH FEEDBACK, UNLESS OTHERWISE SPECIFIED, SHALL HAVE ADJUSTABLE SENSITIVITY THROTTLING RANGE, AND A SCALE RANGE OF AT LEAST 1/4 DEG. F. THE CONTROL POINT SHALL BE ADJUSTABLE TO DEG. F. ABOVE AND BELOW ITS INTENDED SETTING.

- 2) PNEUMATIC THERMOSTATS SHALL BE CAPABLE OF CONTROLLING WITH PLUS OR MINUS 1/2 DEG. F., AND SHALL BE RESPONSIVE TO A 1/4 DEG. F. CHANGE.

#### B. DAMPERS OPERATORS

- 1) ALL DAMPER OPERATORS SHALL BE OF THE MOLDED SYNTHETIC RUBBER DIAPHRAGM PISTON TYPE. THEY SHALL BE FULLY PROPORTIONING, UNLESS OTHERWISE SPECIFIED. THEY SHALL BE QUIET IN OPERATION AND SHALL HAVE AMPLE POWER TO OVERCOME FRICTION OF DAMPER LAMINAE AND AIR PRESSURE ACTING ON LOUVERS.

- 2) DAMPER OPERATORS SHALL BE CAPABLE OF OPERATING AT VARYING RATES OF SPEED TO CORRESPOND TO THE DEMANDS OF THE CONTROLLERS AND VARIABLE LOAD REQUIREMENTS.

- 3) DAMPER OPERATORS SHALL BE CAPABLE OF OPERATING IN SEQUENCE WHEN REQUIRED BY THE SEQUENCE OF OPERATION. THE OPERATORS SHALL HAVE EXTERNAL ADJUSTABLE STOPS TO LIMIT THE STROKE IN EITHER DIRECTION. THE OPERATOR LAMINAE ARRANGEMENT SHALL BE SUCH AS TO PERMIT NORMALLY CLOSED POSITIONS OF THE DAMPERS AS REQUIRED.

#### C. DAMPERS

- 1) ALL AUTOMATICALLY CONTROLLED DAMPERS SHALL BE OF THE OPPOSED BLADE TYPE. THE DAMPERS SHALL HAVE BLADES OF 18 GAUGE GALVANIZED STEEL WITH A MAXIMUM WIDTH OF EIGHT (8) INCHES AND MAXIMUM LENGTH OF FORTY-FOUR (48) INCHES. THE BEARING SHALL BE NON-FERROUS SLEEVE TYPE. THE FRAMES SHALL BE OF 2 X 1/2 INCH CHANNEL IRON MINIMUM, WITH WELDED CORNERS AND STIFFENING MEMBERS TO FORM A RIGID ASSEMBLY. ALL DAMPERS SHALL HAVE BOTH BLADES AND FRAMES GALVANIZED. ALL DAMPERS SHALL HAVE SOLID STOPS WITH VINYL EDGING TO INTERLOCK IN ORDER TO PREVENT LEAKAGE WHEN DAMPERS ARE CLOSED.

- 2) DAMPERS MAY BE SIZED BY CONTROL MANUFACTURER, HOWEVER, THE FRAME SIZE OF THE DAMPERS SHALL BE FULL DUCT SIZE. NO DAMPER SHALL BE SIZED FOR HIGHER THAN 1200 FPM FACE VELOCITY UNLESS INDICATED OTHERWISE.

#### D. AIR PIPING

- 1) THE CONTROL AIR PIPING SHALL BE OF 3/8" SEAMLESS COPPER TUBING WITH SOLDER FITTINGS WHERE CONCEALED IN CONSTRUCTION OR SOLIDIFIED, FLARED OR COMPRESSION TYPE FITTINGS WHERE EXPOSED. THE CONTROL PIPING SHALL BE SOFT DRAWN IN CONCEALED LOCATIONS AND WHERE EXPOSED, PIPING SHALL BE HARD TEMPER COPPER TUBING. PIPING SHALL BE RUN HORIZONTALLY LEVEL AND VERTICALLY PLUMB, WITH REASONABLE PITCH TO DRAIN POCKETS. ALL LOW POINTS IN MAINS AND BRANCHES SHALL BE INSTALLED WITH VALVED DRAIN POCKETS.

- 2) ALL HIGH PRESSURE (80-100 PSIG) AIR PIPING SHALL BE COPPER.

- a) WITHIN MECHANICAL EQUIPMENT ROOMS AS NOTED.
- b) WITHIN CONTROL PANELS AND CABINETS.

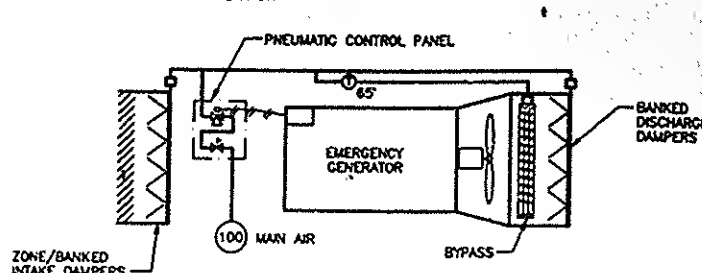
#### E. GAUGES

- 1) AIR PRESSURE INDICATING GAUGES OF AT LEAST 1-1/2" IN DIAMETER SHALL BE FURNISHED AND INSTALLED TO INDICATE THE VARIABLE CONTROL AIR PRESSURE FOR EACH CONTROL DEVICE, SUCH AS RELAYS, SWITCHES AND PILOT VALVES.

- 2) PLUGGED TEE AIR GAUGE CONNECTION SHALL BE FURNISHED AND INSTALLED AT EACH CONTROLLED DEVICE SUCH AS DAMPER MOTORS. A MAIN LOCAL PRESSURE GAUGE SHALL BE FURNISHED AND INSTALLED AT THE MAIN LOCAL CONTROL PANEL INSTALLED IN THE BULKHEAD.

### 3. SEQUENCE OF OPERATION

#### A. EMERGENCY GENERATOR

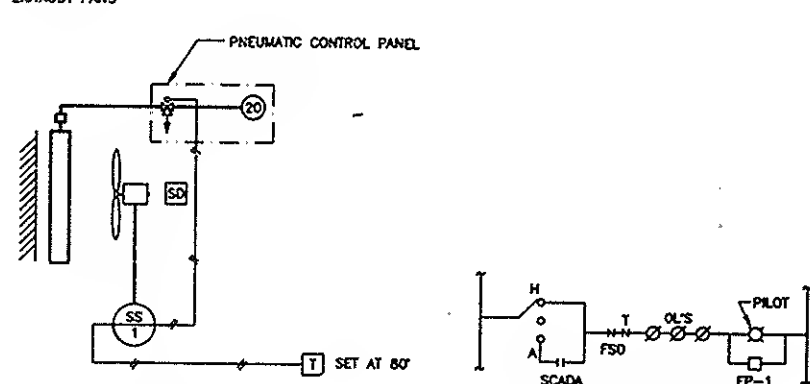


- 1) MAIN AIR AT 100 PSI FROM THE 9TH FLOOR MEPS TO BE FED TO THE PNEUMATIC CONTROL PANEL, WHERE IT IS REDUCED TO 20 PSI WITH A PRESSURE REDUCING VALVE. THE TEMPERATURE CONTROL CONTRACTOR TO PROVIDE A PNEUMATIC CONTROL PANEL OF EQUIVALENT SIZE TO HOUSE ALL EP SWITCHES FOR ALL SYSTEMS IN THE BULKHEAD.

- 2) A START SIGNAL FROM AN EMERGENCY GENERATOR SHALL ENERGIZE ITS DEDICATED EP SWITCH AND PRESSURIZE THE ZONED DAMPER OPERATORS FOR THE INTAKE AND DISCHARGE DAMPERS. DAMPERS SHALL BE FULLY OPEN WITHIN 10 SECONDS.

- 3) THE BYPASS DAMPERS PNEUMATIC THERMOSTAT SHALL BE ENERGIZED ANY TIME THE GENERATOR IS ENERGIZED. THE PNEUMATIC DAMPERS WILL OPEN IF THE THERMOSTAT READS 65 F OR BELOW.

#### B. EXHAUST FANS



CONTROL DIAGRAM EF-1 & 2

EF-1 & 2 WIRING DIAGRAM

- 1) EF-1 AND EF-2 SEQUENCE OF OPERATION

- 2) START/STOP CONTROL

- a) THE FAN MAY BE STARTED AND STOPPED LOCALLY AT THE MOTOR STARTER HAND-OFF-AUTOMATIC SWITCH. WHEN THE HOA IS IN THE AUTOMATIC POSITION, THE FAN MAY BE STARTED/STOPPED THROUGH THE SCADA SYSTEM EITHER MANUALLY BY A KEYBOARD COMMAND OR AUTOMATICALLY ACCORDING TO A PROGRAMMED TIME SCHEDULE, AS LONG AS THE ROOM TEMPERATURE IS ABOVE 80 F.

- 3) WHEN THE FAN IS ENERGIZED AND THE ROOM TEMPERATURE IS ABOVE 80 F, EP-1 WILL BE ENERGIZED AND PNEUMATIC DAMPER MOTOR SHALL DRIVE DISCHARGE DAMPER OPEN.

- 4) IF THE ROOM TEMPERATURE IS BELOW 80 F, THE FAN SHALL REMAIN OFF. EP-1 WILL VENT POSITION, AND DISCHARGE DAMPER SHALL CLOSE.

- 5) IF LOSS OF POWER, UNITS SHALL RESTART WHEN POWER IS RESTORED ON A SCHEDULED STARTUP PROGRAM.

- 6) SMOKE DETECTOR ON SUCTION SIDE SHALL SHUT DOWN EXHAUST FAN AND ALARM FIRE COMMAND STATION.

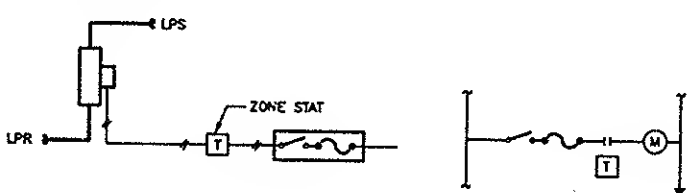
#### C. UNIT HEATERS

- 1) UN-1 THROUGH UN-12 SEQUENCE OF OPERATION.

- 2) UNIT HEATERS MAY BE STARTED AND STOPPED LOCALLY AT THE UNIT THROUGH A FUSED DISCONNECT SWITCH.

- 3) WHEN THE UNIT HEATER IS ENERGIZED AND THE ZONE THERMOSTAT SHALL MAINTAIN THE ROOM TEMPERATURE AT 65 F, FAN SHALL CYCLE TO MAINTAIN THE TEMPERATURE.

- 4) IN WINTER, IF THE GENERATORS SHOULD OPERATE, THE UNIT HEATERS WILL BE ON CONSTANTLY.



TO EXISTING RISER RISER 7 CLOSE SHUTOFF VALVES